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TWENTIES project

Improving the integration of renewable energy sources in the European electricity networks

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Introduction



Quiz: Where do I come from?



① Originally a Celtic settlement. Later the Roman city was founded in 14 BC as Asturica Augusta

② Its University was founded in 1218 (one of the oldest universities in the world)

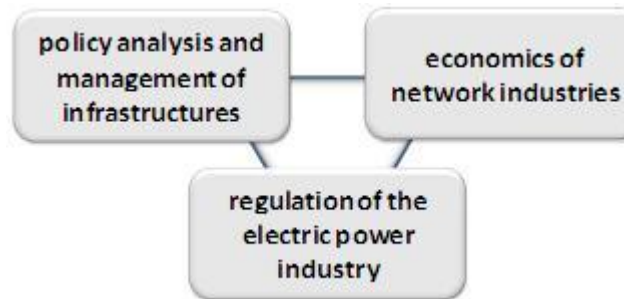
③ Its history spans about 2,800 years. Pablo Picasso was born there (and Antonio Banderas). Average of about 300 days of sunshine per year (Costa del Sol)

④ 1992 Summer Olympic Games. The city fourth most visited in Europe after Paris, London, and Rome. Plenty of Gaudí buildings.

⑤ The capital and largest city of Spain. Prado Museum, among many others... Universidad Pontificia Comillas.

Why now at Berkeley Lab?

- Tenured Professor at the Electrical Engineering Dpt. of the ICAI School of Engineering, Universidad Pontificia Comillas.
- Coordinator of the Erasmus Mundus Joint Master in Economics and Management of Network Industries (**EMIN**) and Director of the Master in the Electric Power Industry.



- LBL is an Associate Partner of the Consortium
- Scholarships funded by the European Commission for both students and scholars
- Summer stay at the Lab (from July 24 to August 31), EETD, Dr. Chris Marnay.

EMIN Consortium

EMIN Partners



UNIVERSITÉ
PARIS-SUD 11



Degree
Awarding



European
University
Institute



EMIN Associate Members



Iberdrola, Endesa, Gas Natural, Red Eléctrica de España, OMEL (Iberian Energy-Market Operator), Wind to Market, InterMoney, Enexis, Microeconomics, and Delta Netwerkbedrijf B.V.

www.eminmaster.eu

www.upcomillas.es/mse

Institute for Research in Technology (IIT)

- IIT is a non-profit research center of ICAI School of Engineering, which belongs to the Universidad Pontificia Comillas, Madrid, Spain
- Its main objective is to promote research and post-graduate studies in different technological fields, by means of developing research projects of interest for the Industry and Administration.
- Research Areas:
 - Area of Smart and Green Networks (REDES)
 - Area of Modeling, Analysis and Control (MAC)
 - Area of Decision Support Systems in the Energy Sector (SADSE)
 - Area of Regulation and Economics of Energy (RYE)
 - Area of Engineering Design (ADI)
 - Area of Railway Systems (ASF)
 - Area of Intelligent Systems (ASI)
 - Group of Electronics and Automation (GEA)
- Approx. 60 doctors + 60 postgraduate students
- Income 5.23 MEur in 2011

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- Erasmus Mundus Joint Doctorate in Sustainable Energy Technologies and Strategies

www.upcomillas.es/estudios/estu_doct_sets.aspx





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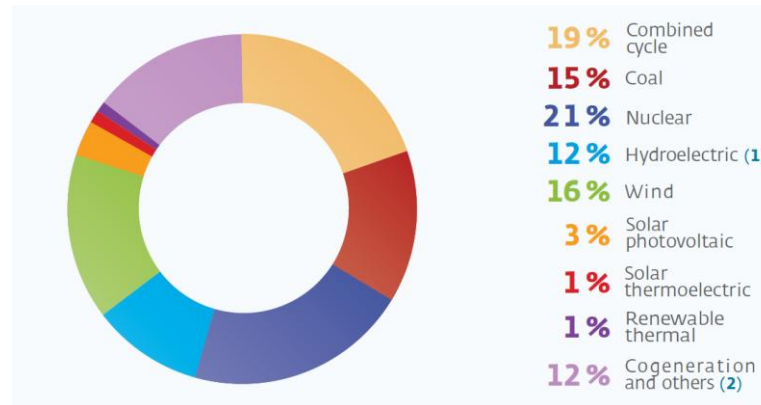
Challenges



Some facts about Spain

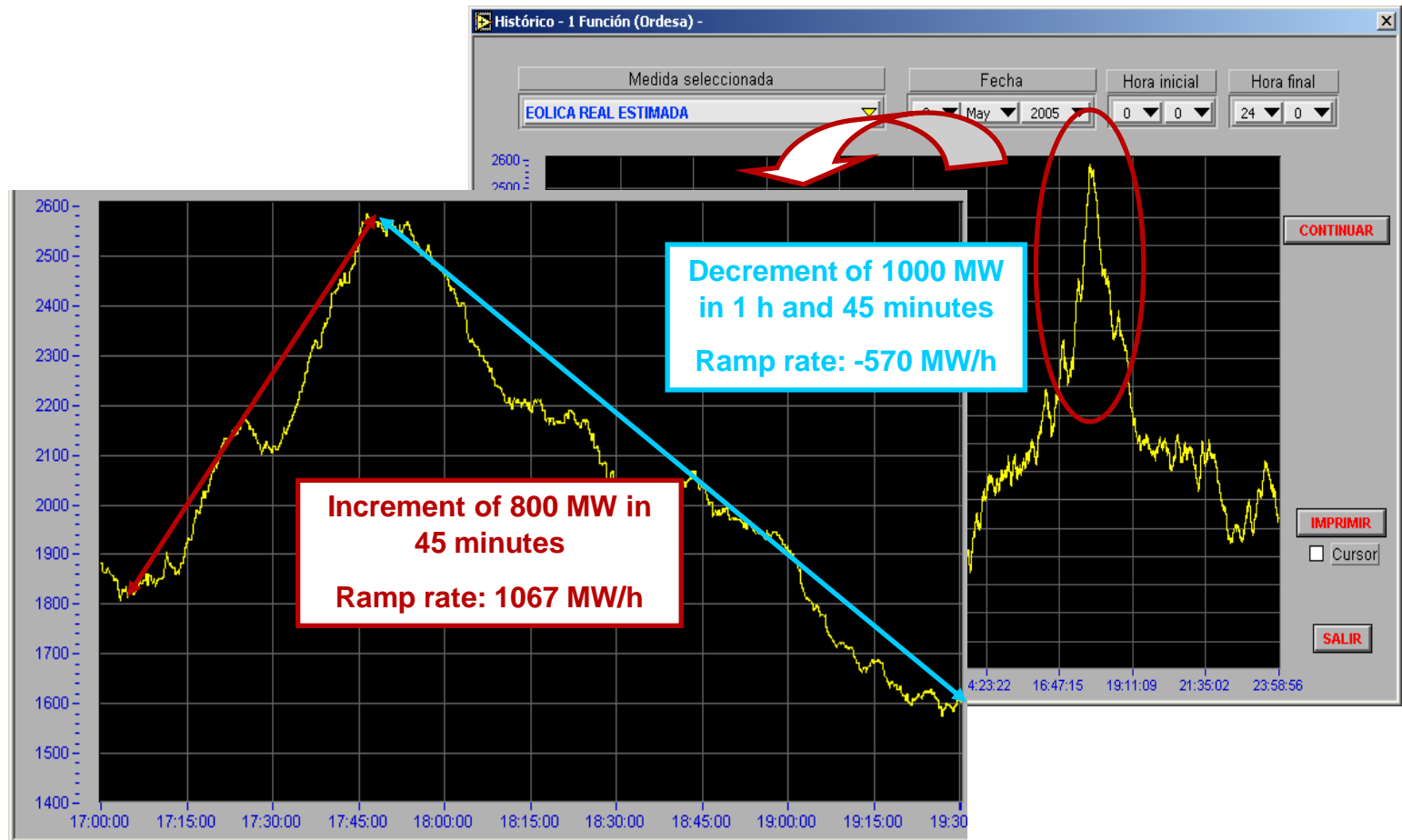
- Population in Spain: 47,2 Million
- 2011 data :
 - GDP per capita: \$30,626 (PPP)
 - Demand (b.c.) 269,816 GWh
 - Winter peak: hourly 44,107 MW, daily 883 GWh
 - Summer peak: hourly 39,537 MW, daily 791 GWh

source: REE

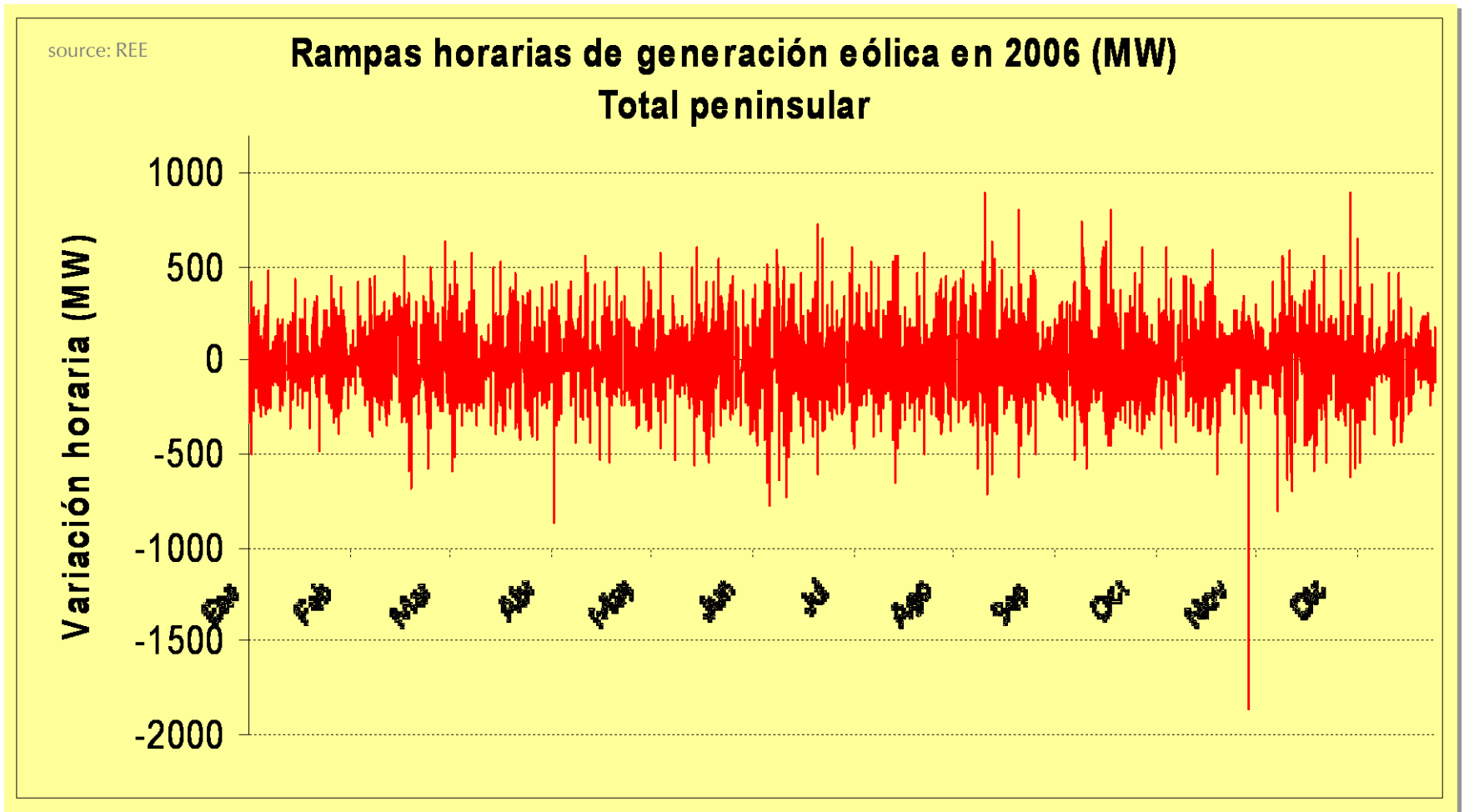


- Spain: leader in renewable energies. Inst. Capacity of wind power by 2011: 21.6 GW
- <http://www.ree.es/ingles/home.asp>

High ramps in WG



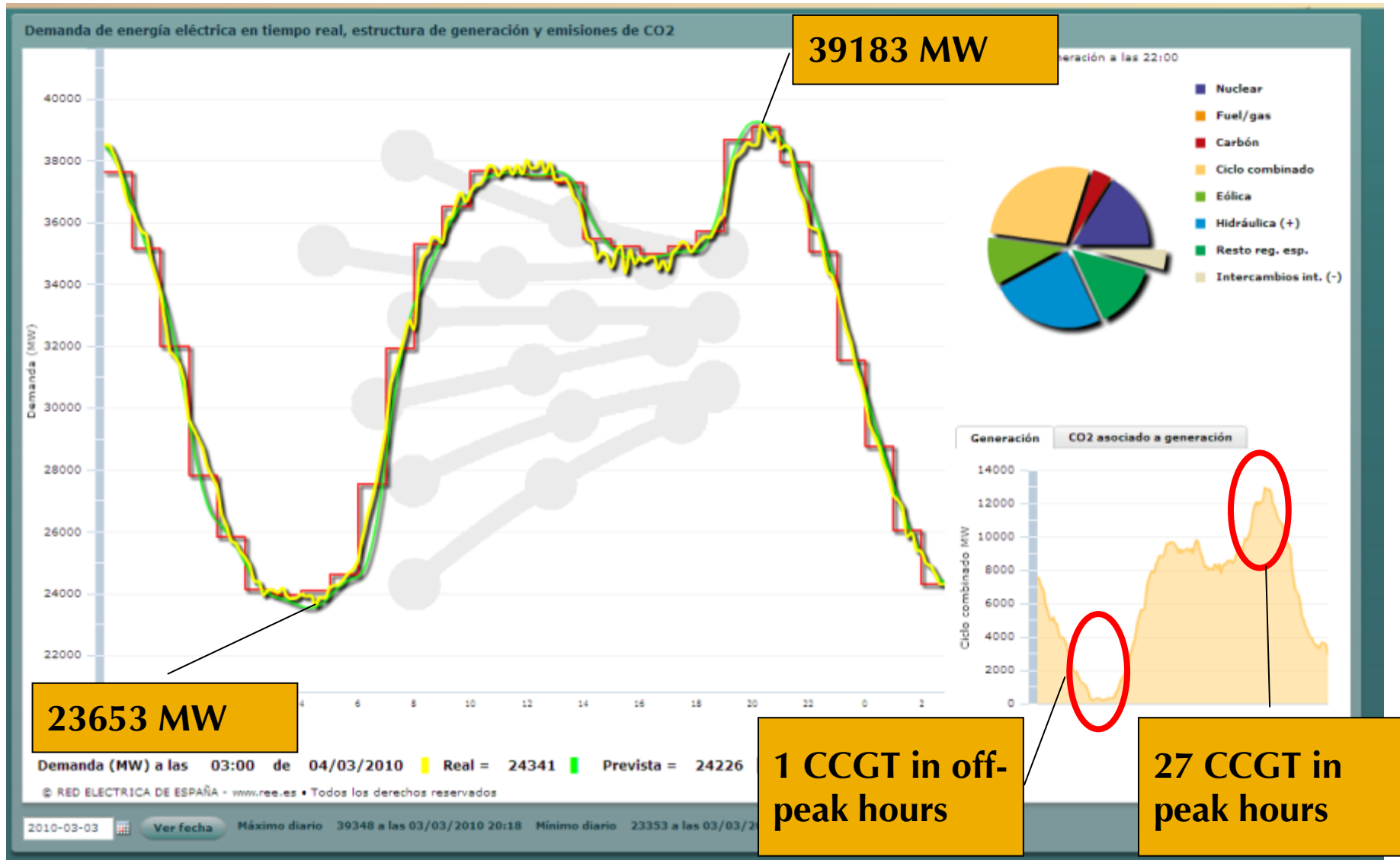
Hourly ramp rates of WG



Effects of intermittent generation (WG) at different time scopes

- Medium and long-term planning. Reliability assessment
 - Will there be enough generation to meet peak loads? Determine some system adequacy reliability measures. **NEED OF COMPLEMENTARY UNITS**
- Short-term operation planning. Unit commitment
 - Strong **variability** of WG over the day. Opposite behavior with respect to the demand in certain periods
 - Ramps, minimum load, startups and shutdowns. **NEED OF FLEXIBLE UNITS**

Load demand (2010-03-03)



Challenges

- How can the European electric system be prepared for integrating a larger amount of wind power but keeping its present level of reliability?
- The EU is aware of the need of a joint collaboration between the main actors involved: Transmission System Operators, Renewable Energy Companies, Manufacturers, and R&D institutions.
- Main questions that need to be addressed are:
 1. What are the valuable contributions that intermittent generation and flexible load can bring to system services?
 2. What should the network operators implement to allow for off-shore wind development?
 3. Which are the best strategies in order to give more flexibility to the transmission grid?
- TWENTIES project will try to answer these questions.

Transmission system operation with large penetration of
Wind and other renewable
Electricity sources in
Networks by means of innovative
Tools and
Integrated
Energy
Solutions

Start: April 2010

End: March 2013

Supported by:





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Presentation of TWENTIES

(see attached file)



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Preliminary results & Questions

(see attached file)





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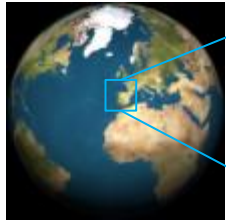
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Quiz answers



① Astorga (León)

② Salamanca

③ Málaga

④ Barcelona

⑤ Madrid

Dissemination events

□ TWENTIES sessions in recent & upcoming events:

- ✓ Grid Capacity and Stability Conference. London, 20-21 June 2012. V. González (REE)
- ✓ Dynamic Line Rating Day. Brussels, 14 June 2012.
- ✓ 4th General Assembly of the European Technology Platform on SmartGrids. Rome, March 2012. José L. Mata (REE).
- ✓ IEEE-Overhead lines ESMOL subcommittee/CIGRE AG06-B2 joint meeting. Tampa, Florida (USA), February 2012. Jean-Louis Lilien (ULg).
- ✓ SET Plan Conference. Warsaw, November 2011. J.L. Mata (REE).
- ✓ Polish Wind Energy Association. Warsaw, Nov. 2011. Miguel Lorenzo (REE), Roberto Veuillas (IBD)

www.twenties-project.eu

Dissemination events

Workshops

- ❑ Electricity Supply Industry (ELIA)
Innogrid+ 2020: February 2012
Sponsored by EDSO4SG, Grid+ Project and ENTSO-E
EU 140 experts of near 100 companies, institutions and organizations
from 22 countries of the European Union.
Participation: Conference and Poster Session.
- ❑ Tech. Community (ABB, ALSTOM, SIEMENS, GAMESA) &
- ❑ Wind power community (EWEA).
European Wind Industry Annual Meeting: April 2012
More than 50 stakeholder attendance.
Dissemination of Twenties objectives and inputs came from wind and other
relevant actors in the industry.
Contact with media.

www.twenties-project.eu

Dissemination events

Workshops

- ❑ENTSO-E (REE)

Brussels, June 2012

System Operation Committee or RG Continental Europe

Top level system operation experts from all TSOs in Europe

Participation: Aprox. 1 h. presentation

- ❑Baltic and Mediterranean WS (EWEA).

EWEA offered to split this WS in two, one for Baltic and one for Balkan

countries, within the framework of EWEA Emerging Markets events: Riga, Rumania, Bulgaria, Latvia.

www.twenties-project.eu

Next steps

Technical visits are to be arranged in order to give more visibility of TWENTIES
Demos:

June/July

- ✓ Demo 1: Leader: IBD, Site: REE CECRE (Madrid), Subject: Preliminary test results, real time tests of voltage control application
- ✓ Demo 2: Leader: DONG, Site: Faeroe Islands, Subject: VPP concept for a very small isolated systems. VPP application as an additional resource for system inertia.
- ✓ Demo 6: Leader: ABB, Site: ABB factory in Sweden, Subject: FAT test of the OLC control system

Sept/Oct

- ✓ Demo 5: Leader: Elia, Site: Coreso facilities, Subject: Implementation of PST optimisation algorithms, DLR and system surveillance with WASM
- ✓ Demo 3: Leader: RTE, Site: Lille lab facilities, Subject: Mock up implementation and performance

Next Steps

Nov/Dec

- ✓ Demo 6: Leader : REE, Site: Magallón SE, Subject: Site visit to OLC device
- ✓ Demo 2: Leader: DONG, Site: Copenhagen, Subject: VPP day
- ✓ Demo 3: Leader: ALSTOM, Site: ALSTOM Labs CERDA (Villeurbanne), Subject: HVDC breaker test, Remark: Access limited to EC representatives (PO & Pr. Reviewer)

Energint.dk is going to propose a date for site visit related Demo 4.